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ABSTRACT

The recommended procedures for the consolidation of the data processing centers for three school districts, a community college district, and a county office of education are described. The report contains a description of the procedures used to select the recommended consolidation plan. In addition, a suggested plan for allocation of costs and a schedule for central systems implementation are provided. Hardware and software considerations are listed together with time requirements for various tasks that must be done. (DGC)

Report to
ELECTRONIC DATA PROCESSING STEERING COMMITTEE
on a
RECOMMENDATION FOR DATA PROCESSING CENTER CONSOLIDATION

PEAT, MARWICK, MITCHELL & CO.
555 CAPITOL MALL
SACRAMENTO, CALIFORNIA 95814

January 7, 1975

Mr. William Rutland, Chairman
Electronic Data Processing Steering Committee
c/o Superintendent of Schools
Sacramento County Office of Education
6011 Folsom Boulevard
Sacramento, California 95819

Dear Mr. Rutland:

On December 3, 1974, Peat, Marwick, Mitchell & Co. (PMM&Co.) completed its study to determine the feasibility of consolidating the data processing centers of the following agencies:

- Grant Joint Union High School District
- Los Rios Community College District
- Sacramento City Unified School District
- Sacramento County Office of Education
- San Juan Unified School District.

After receiving the aforementioned report, the Steering Committee requested PMM&Co. to recommend a specific alternative regarding consolidation.

The attached report contains the following:

1. Development of weights for the qualitative and quantitative criteria for each of the six alternatives outlined in the study.
2. Application of the weights to the criteria for each alternative.
3. Ranking of the alternatives.

4. Recommendation of a specific alternative for consolidation of the five centers.

5. Outline of a recommended procedure to implement the recommended alternative.

6. Specification of the individual agency budgets necessary to implement the recommended alternative.

To provide the reader with a frame of reference, the executive summary from our report of December 3, 1974 has been included as Section I of the attached report.

Very truly yours,

Peat, Marwick, Mitchell & Co.

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I – EXECUTIVE SUMMARY

This section contains an overview of the entire report.

OBJECTIVES OF STUDY

The objective of this study, as stated in Senate Bill 804, is to determine the feasibility of consolidating the electronic data processing centers of four school districts and the Office of the County Superintendent of Schools. Section 3, SB 804 states:

"The consulting firm selected to report shall respond to the following:

(a) Identification of similarities and differences of policies and goals of the existing district and county superintendent of schools operations.

(b) Identification of similarities and differences in operations and services of the data processing centers.

(c) In the areas of education, administration and business, determine the long-range goals for electronic data processing.

(d) Provide an analysis of various alternatives in the field of data processing to achieve the goals reported in subdivision (c) of this section."

APPROACH

We have followed the detailed work plan as outlined in our proposal to the Electronic Data Processing Steering Committee dated January 1974. Three and one-half months were devoted to fact-finding to gain information identifying: similarities and differences of the educational philosophies, policies, priorities and goals of the five agencies; operations and services of each data processing center; and each agency's long-range data processing goals.

During the course of our fact-finding, we visited over 35 different sites. We attended Board of Education meetings at each of the five agencies. Interviews were held with over 225 people, including board members, superintendents, assistant superintendents, college presidents, deans, principals, vice principals, counselors, research directors, administrative department heads and staffs, registrars, teachers, and data processing staffs.

On a regular basis we met with the technical and advisory committees, have discussed our progress to date, as well as supplying preliminary draft material for comment and clarification.

POLICIES AND GOALS OF EACH AGENCY

The high-level goals of each agency are very similar: Provide the best possible education and maintain fiscal responsibility. However, the policies of each agency tend to differ due to the size of the population served and the type of services provided (e.g., the County Superintendent of Schools provides only special services, Grant serves only junior and senior high schools, Sacramento City Unified and San Juan Unified serve grades K-12, and Los Rios serves a junior college population). The very nature of the diversity in size of student population (10,000 to 70,000) and services provides a logical base for different policies being required to meet different problems. However, the type of information necessary to make those policy decisions is common to all agencies.

OPERATIONS AND SERVICES OF THE DATA PROCESSING CENTERS

There is considerable diversity in the resources, staffs, and services offered by each agency's data center. With the exception of Sacramento City Unified and Los Rios, all the agencies have different and therefore incompatible computers. This precludes the simple sharing of common application programs without considerable reprogramming. Data processing staffs range from almost four full-time employees at Grant to over twenty at Sacramento City Unified and Sacramento County Regional Center. Services offered range from almost exclusively business at Grant to almost exclusively pupil personnel at the County Regional Center. These differences exist as a result of available resources and priority setting within each agency. However, the need for a full range of services exists at all agencies.

LONG-RANGE DATA PROCESSING GOALS

In late August and early September of 1974, we held long-range data processing planning sessions at each agency. We requested the participation of the Superintendent, Director of Data Processing, and Assistant Superintendents of Business and Instruction. The

results of those planning sessions were prioritized lists of goals and the approximate cost over the next five years for the implementation of the long-range plans. Figures used by each agency as its estimate of cost five years from now were used for the baseline of comparison (Alternative No. 1).

The goals showed a common need for better, more timely access to information through a data base approach. Such areas as budget, student records, attendance, guidance and career exploration, and personnel data bases ranked high on the lists.

ASSUMPTIONS

In the development of approaches to consolidation, we developed the following assumptions:

- Consolidation alternatives must result in no degradation of service.
- Consolidation alternatives must be both technically and economically feasible.
- Consolidation alternatives must allow for future needs.
- Where possible, software packages (vendor supplied, commercially marketed, or existing systems) will be substituted for custom software development.
- As most of the agencies are contemplating additional hardware and/or personnel to satisfy unmet needs, the economic profile as it would exist in 1979 is used as a baseline.
- Certain functions will remain as agency responsibilties (e.g., data entry, educational consultants, data processing coordinators).
- Hardware cost estimates are based on the average of prices supplied by five vendors.
- Hardware cost estimates are based on one-year lease cost, although final arrangement may be long-term lease or purchase.
- Personnel costs are based on five percent annual inflation and include all fringe benefits.
- Capability for on-line systems is included in all consolidated hardware alternatives.

DEVELOPMENT OF ALTERNATIVES

We originally considered over 30 different alternatives for consolidation before narrowing the list to its present size. Economic and technical feasibility tests were applied to each alternative. We visited many data centers (including the Teale Data Center) to validate many of our assumptions. After much consideration, we finally agreed on the following list of alternatives which were presented at the September 5, 1974 steering committee meeting.

Alternative No.	Hardware	Systems and programming staff	Applications
1	Each agency*	Each agency*	Separate
2	Central**	Central	Common
3	Central**	Central	Separate
4	Central**	Each agency	Separate
5	Central**	Central maintenance Each agency development	Separate
6	Central**	Some central Some each agency	Some common Some separate

* Based on projection for 1979, which each agency developed during the long-range data processing planning sessions.

** Central hardware is based on batch input. (All data is sent by courier service to the central computer center where it is entered into the computer. Reports are returned to each agency via courier.) Each alternative with central hardware has two variations:

1. Each agency has a remote job entry (RJE) station at the agency office which allows data to be entered into the computer from the agency office via high speed communication lines. Each agency also has a printer in the agency office which receives data for printouts via communication lines from the central data center.

2. Each agency has a minicomputer attached to the central data center via high speed communication lines (see above). The minicomputers may perform some applications in-house, including data-editing and formatting as well as acting as a remote job entry station.

After extensive review of the present equipment and applications, we feel that it would not be feasible, advantageous, or result in an immediate cost saving to use the existing

hardware as a basis for a consolidated data processing center. Relocating the present equipment in a single location would not be a consolidation. There would be no reduction of hardware, personnel, or utility costs (e.g., the cost of leasing a facility to house all the existing hardware and staff would be $155,000 per year). Since, with the exception of Los Rios and Sacramento City Unified, all existing hardware is incompatible, it would not be possible to run application programs on any machine other than those machines that the application programs are presently running on. Additionally, three of the machines are operating at capacity and need to be upgraded if they are to be able to provide the same level of service as they have in the past to agencies with growing needs.

It is with the aforementioned factors in mind, including the fact that most of the agencies are contemplating additional hardware and/or personnel (or in the midst of changing) to satisfy unmet needs, that we have used the economic profile as it would exist in 1979 as a baseline.

ANALYSIS OF ALTERNATIVES

In developing a set of comparative characteristics for the analysis of alternatives, we developed two major divisions: quantitative factors and qualitative factors. Quantitative factors consist of one-time costs and recurring costs. One-time costs consist of shipping costs for equipment, disk pack purchase, site prepration, one-time education, conversion costs (contract) and supplementary personnel for system development. Recurring costs include hardware lease, personnel costs including fringe benefits, building lease, utilities, supplies, and ongoing professional education.

Qualitative factors include control, responsiveness (to current and future needs), duplication, potential for management information systems, data processing personnel development, and resource development. Definition of these factors are:

- *Control* – To what degree can each agency determine the direction of data processing emphasis or growth? Can each agency decide what and when it desires and wants from data processing?

- *Responsiveness (Current Needs)* – Can the varying needs and desires of individual users be readily satisfied? What is the ability to respond to immediate requests?

COMPARISON

	QUALITATIVE				
ALT. NO.	CONTROL	RESPONSIVENESS – CURRENT NEEDS	RESPONSIVENESS – FUTURE NEEDS	DUPLICATION	POT MA I.
①	Each agency has complete control within the limitations of its capabilities Greatest individual control.	Can respond immediately to all requests if they are within agency capability, resources and D.P. policies.	Agencies do not have capability to meet all their future needs. Least responsive.	Greatest amount of duplication exists. Least conducive to record sharing.	Least to lin indivi
②	Least individual control. Must function thru a committee.	Greatest resources available to user, but also greatest contention for some resources. Least responsive for "immediate" turnaround.	Greatest potential for long range planning and future directions.	Least duplication. Most efficient utilization of available resources.	High for pr level plan
③	District controls their own applications, but hardware and personnel are controlled thru committees.	Responsive on regularly scheduled programs. "One Shot" emergencies must go through a priority review.	Has capability to respond to future needs if agencies will agree on common needs.	Much duplication of effort and inefficient utilization of equipment.	Capa depe thru distr
④	Second greatest amount of individual district control.	Can be extremely responsive to user needs within schedule of hardware availability.	Can be responsive but requires extensive agency planning. Extent of data base is limited.	Must duplication of effort and inefficient utilization of equipment.	Limi for hard exis
⑤	Some control, thru separate development staff and separate applications.	Can be extremely responsive to user needs within schedule of hardware availability.	Can be responsive but requires extensive agency planning. Extent of data base is limited.	Much duplication of effort and inefficient utilization of equipment.	Lim MIS cape
⑥	Control over those applications that are separate. Committee controls common applications	Can be extremely responsive to user needs within schedule of available resources.	Second greatest potential for long range planning and preparation for future directions.	Limited duplication. Second most efficient utilization of resources.	Sec pot base data app

F ALTERNATIVES

			QUANTITATIVE	
TIAL FOR GEMENT). SYS.	DATA PROCESSING PERSONNEL DEVELOPMT.	RESOURCE AVAILABILITY	ONE-TIME COSTS	RECURRING COSTS
ntial due ion of resources.	Personnel have the least opportunity for education and advancement	Minimum resources available.	NONE	2,468,873
otential ding policy mation and models.	Best opportunity for career advancement and education. Will attract most qualified personnel.	Greatest combination of resources is available.	Total 223,000 Less Present Equipment -325,000 Net (-102,000)	Batch 2,096,056 RJE 2,342,198 Mini 2,495,498
for M.I.S. on future individual plications	Good opportunity for advancement but personnel cannot take advantage of available resources.	Good availability of resources, but they are not used to their best advantage.	Total 425,000 Less Present Equipment 325,000 Net 100,000	Batch 2,281,596 RJE 2,527,738 Mini 2,681,038
otential lthough capability	Limited opportunity for career development.	Good hardware capability, but none of resources are used most effecien y.	Total 425,000 Less Present Equipment 325,000 Net 100,000	Batch 2,703,032 RJE 2,549,174 Mini 2,579,211
otential for ough exists.	Limited opportunity for career development for agency development staff. Central maintenance group has good career opportunity.	Good hardware availability, but none of resources are used most efficiently.	Total 425,000 Less Present Equipment 325,000 Net 100,000	Batch 2,401,315 RJE 2,647,457 Mini 2,800,757
ghest for MIS common and s.	Good opportunity for career advancement for central staff. Limited opportunities for decentralized staffs.	Good availability of resources. Second best utilization of resources.	Total 334,000 Less Present Equipment 325,000 Net 9,000	Batch 2,283,669 RJE 2,529,811 Mini 2,683,111

- *Responsiveness (Future Needs)* – How flexible is the alternative? What is its capability for future growth? Will future growth require major changes in data processing systems or has this been planned for?

- *Duplication* – How efficient is the overall data processing system? Is there a maximum utilization of resources? Does this alternative lend itself to sharing – are records (e.g., interdistrict student transfers) compatible enough to be transferred between agencies with no apparent effort?

- *Potential for Management Information Systems* – Does the alternative have the capability to provide high level policy information (as opposed to operational information)? Can this information be a vital planning tool for building future models?

- *Data Processing Personnel Development* – Does the alternative provide a career path for data processing personnel? Will there be professional challenges and educational opportunities? Is there an opportunity for professional growth?

- *Resource Availability* – What level of hardware, software and personnel skills are available to each agency?

A summary of the qualitative and quantitative factors for each alternative is illustrated on the facing page.

In applying the test of economic feasibility to the alternatives, we discovered that it would *not* be economically feasible for Grant Joint Union High School District to be a participating member of a consolidated data center under Alternative Nos. 3, 4 and 5. Under those alternatives, Grant would be better served, from a cost-effectiveness standpoint, as a user of another participant in the consolidated center. However, under Alternative Nos. 2 and 6, Grant could pass the test of economic feasibility as a participant in a consolidated data center.

CONCLUSION

Based on our fact-finding and analysis, we do not believe that immediate consolidation would be either economically or technically feasible. However, based upon a five-year projection of the agencies' needs and resources, several forms of consolidation are both economically and technically feasible.

II – DEVELOPMENT OF RECOMMENDATION

The alternatives and factors discussed in Section I provide the basic structure upon which weighting factors are applied. The purpose is to determine the alternative mode of data processing most responsive to the current and future needs of the five agencies involved.

WEIGHTING OF FACTORS

In developing relative weights for each factor, we first carefully considered the balance between qualitative and quantitative factors. Qualitative factors deal with such issues as whether the needs, for which the service is implemented, are being satisfied, how effectively they are being met and whether they can continue to be satisfied in the future. As these are the key issues which justify the very existence of data processing centers, we assigned 60 percent of the weight to the qualitative factors. The remaining 40 percent was assigned to quantitative factors to indicate that while these quantitative factors were sufficiently important to weigh heavily in choosing an alternative, they were not of sufficient significance to be the sole basis of decision. The total possible point value for quantitative and qualitative factors is 100 points.

Qualitative Factors

The assignment of specific point values to each qualitative factor was accomplished by first ranking the factors in order of importance, then assigning each a weight. We felt that the factors relating to *responsiveness to current needs* and *responsiveness to future needs* were of equal importance. Therefore, they both were assigned the same weight. *Control, resource availability* and *duplication* were weighted to reflect a combination of similar levels of importance in relation to each other, but significant difference relative to other qualitative factors.

The alternatives were then ranked by a subjective measurement against each qualitative factor. The alternative which ranked first was awarded the full possible point value. Each of the other alternatives was assigned a lesser value based on a distribution that reflected the differences between alternatives. For example, in distributing the weights assigned to *Responsiveness – Current Needs*, we concluded that Alternative No. 1 was the most responsive and therefore was awarded the full 12 points. Alternative Nos. 4, 5, 3 and 6 were very close to

each other in responsiveness, yet showed enough variance to be assigned one-point differences. Alternative No. 2 was the least responsive in this area and the assigned value of three points reflects that judgment. Each of the other six qualitative factors was treated similarly.

The differences between batch, RJE, and mini were evident in a few select environments such as *Responsiveness – Current Needs* for the instructional program at Los Rios. However, the weighted average of applications at all five agencies within any one factor totaled less than one-half point. Therefore, the differences between batch, RJE and mini were not considered significant in the qualitative evaluation. The factors discussed in this section are the effects on the application programs, and do not affect the method of data input.

Ranking qualitative factors	Responsiveness - current needs	Responsiveness - future needs	Control	Resource availability	Duplication	Potential for management information systems	Data processing personnel development	Qualitative total
Total possible weight	12	12	9	9	9	6	3	60
Alternative No. 1	12	3	9	1	0	1	1	27
Alternative No. 2:								
Batch	3	12	1	9	9	6	3	43
RJE	3	12	1	9	9	6	3	43
Mini	3	12	1	9	9	6	3	43
Alternative No. 3:								
Batch	7	7	4	5	4	3	2	32
RJE	7	7	4	5	4	3	2	32
Mini	7	7	4	5	4	3	2	32
Alternative No. 4:								
Batch	9	6	7	5	4	2	1	34
RJE	9	6	7	5	4	2	1	34
Mini	9	6	7	5	4	2	1	34
Alternative No. 5:								
Batch	8	6	6	5	4	2	1	32
RJE	8	6	6	5	4	2	1	32
Mini	8	6	6	5	4	2	1	32
Alternative No. 6:								
Batch	6	9	3	7	7	4	3	39
RJE	6	9	3	7	7	4	3	39
Mini	6	9	3	7	7	4	3	39

Quantitative Factors

Quantitative factors are the one-time and recurring costs referred to in Section I.

The weights for quantitative factors were allocated as follows: Of the 40 points allocated, five points for one-time costs, 35 points for recurring costs. The distribution of those points to each alternative was based on a mathematical formula reflecting the actual dollar differences between each alternative. The least costly alternative was awarded 100 percent of the possible points, while the most expensive was assigned 0 percent.

	Quantitative Factors				
	One-time costs (5 points)		Recurring costs (35 points)		
	Percentage	Weighting	Percentage	Weighting	Total
Alternative No. 1	50%	3*	47%	16	19
Alternative No. 2:					
Batch	100	5	100	35	40
RJE	100	5	65	23	28
Mini	100	5	43	15	20
Alternative No. 3:					
Batch	0	0	74	26	26
RJE	0	0	39	14	14
Mini	0	0	17	6	6
Alternative No. 4:					
Batch	0	0	71	25	25
RJE	0	0	36	13	13
Mini	0	0	31	11	11
Alternative No. 5:					
Batch	0	0	57	20	20
RJE	0	0	22	8	8
Mini	0	0	0	0	0
Alternative No. 6:					
Batch	45	2	73	26	28
RJE	45	2	38	13	15
Mini	45	2	17	6	8

* Percentage times the possible points rounded to nearest whole number. For example, Alternative No. 1 – one-time cost: 50% x 5 points = 2.5 rounded to 3.

RANKING ALTERNATIVES

Alternatives	1	2			3			4			5			6			Total possible points
		Batch	RJE	Mini	Batch	RJE	Mini	Batch	RJE	Mini	Batch	RJE	Mini	Batch	RJE	Mini	
Qualitative weights	27	43	43	43	32	32	32	34	34	34	32	32	32	39	39	39	60
Quantitative weights	19	40	28	20	26	14	6	25	13	11	20	8	0	28	15	8	40
Total weighted value	46	83	71	63	58	46	38	59	47	45	52	40	32	67	54	47	100
Rank	11	1	2	4	6	11	15	5	9	13	8	14	16	3	7	9	

RANKING

The chart on the facing page depicts a summary of the qualitative and quantitative point totals for each alternative carried forward from the detailed sections on the preceding pages. "Total weighted value" equals the sum of those point totals; rank is based on highest total point value.

RECOMMENDATION

Based on the weighted values of the alternatives on the preceding pages, the batch mode of Alternative No. 2 ranks as the highest alternative. We feel that the batch alternative, which requires that data be carried to and from the central data center by courier, is comparable to the present levels of service. As all agency administrative offices are located within five miles of the recommended central data center site, data can be delivered within 15 minutes. Additionally, with the choice of Alternative No. 2, which is based on common applications, a strict computer operations schedule will be required. Therefore, there would be no great advantage in turnaround time to be gained through the use of the more costly remote job entry approach. It should be pointed out that telecommunications costs were not included in the baseline, Alternative No. 1. However, the capability for telecommunications was built into the central hardware specifications. Each agency may, at its option, budget additional funds for remote job entry.

AGENCY BUDGETS – IMPLEMENTATION OF ALTERNATIVE NO. 2

	FY 1975-76	FY 1976-77	FY 1977-78	FY 1978-79	Present FY 1974-75	Baseline – FY 1979-80 Alternative No. 1
Grant Joint Union High School District	$ 90,825	76,300	91,400	83,842	104,500*	92,583
Los Rios Community College District	326,300	305,000	463,550	482,093	321,000	580,185
Sacramento City Unified School District	371,050	355,700	452,150	398,251	364,400	456,741
Sacramento County Regional Center	551,200	593,800	774,850	859,383	536,200	1,018,410
San Juan Unified School District	284,625	318,300	319,050	272,478	280,000	320,954
Total	$ 1,624,000	1,649,100	2,085,000	2,096,056	1,606,100	2,468,873

* Includes one-time $32,000 expenditure for purchase of a minicomputer.

Note: FY 1974-75 budgets furnished by agencies. FY 1979-80 budgets developed by agencies as a result of long-range planning sessions.

AGENCY BUDGETS

The chart on the facing page contains individual agency data processing budgets for the implementation of Alternative No. 2.

The first column contains cost figures for first-year implementation. It is based on the 1974-75 budget, plus equal cost sharing of the contract to develop a common chart of accounts, plus $15,000 in education costs spread proportionally based on staff size.

The second column shows the second-year implementation schedule. Central hardware is installed in the last quarter of this year. The budget allows for a two-month overlap of present hardware and new central hardware. The figures presented are based on present data processing budgets, plus 5% salary inflation, plus one-time implementation costs, plus recurring costs prorated for the last quarter, less the sale of present equipment, less rental cost of equipment no longer needed (prorated for two months).

The third column represents third-year implementation costs. These figures are based on a sharing of the total data processing costs. They were computed by averaging each agency's present budget (column 5) and five-year projected budget (column 6) to arrive at a percentage figure which was used as the guide for cost distribution.

The fourth column, fourth-year implementation cost, is based on a percentage of the total cost for the baseline (the projected fifth-year budget of each agency – column 6) applied to the total cost for Alternative No. 2.

The fifth column shows the data processing budgets as they presently stand for the 1974-75 school year.

The sixth column shows the projected fifth-year budget for each agency based on agency long-range planning sessions. This is Alternative No. 1 which was used as the baseline for comparison.

III – IMPLEMENTATION

APPROACH

Our experience in designing and implementing data processing systems has indicated that a phased approach assures a successful implementation. The phases divide the study into manageable units, providing milestones to measure the progress of the implementation. They also provide points for reevaluation and approval before proceeding to the next step. Implementation charts can be found following this section.

1. Hardware procurement
2. General systems design
3. Detail systems design
4. Implementation.

HARDWARE PROCUREMENT

This first phase is the basis upon which consolidation is built. It is the hardware decisions that are made in this phase that will decide the overall scope of effort necessary to develop common systems for a central hardware facility. The decisions made here will determine the overall development costs due to different application "packages" and high level languages available on various brands of computers.

GENERAL SYSTEMS DESIGN

The concepts of the general system are developed in this phase. The interrelationships of each module are identified along with the information that management deems necessary, and the constraints and policies under which the system must operate. Each module will be designed to permit implementation independent of the development of other modules.

It is in this phase that the implementation plan is developed. This plan will assign priorities for the development of each module and will specify which modules will initially be computerized and which will initially be manually processed.

DETAIL SYSTEMS DESIGN

In this phase the general design is divided into its smallest parts to determine key processing requirements. These requirements involve the number and name of files, the structure of the files and the record layouts. The interaction of files is examined and the internal (computer) requirements for processing data are developed. As implementation occurs and resources become available, additional modules will be designed and implemented in a priority sequence defined in Phase I. It is important to note that even though this phase is primarily data processing oriented, it is anticipated that documentation of a manual module will occur concurrent with the detailed design of the automated module.

IMPLEMENTATION

In this phase the programs and operating procedures for computerized modules are prepared. The programs are tested and debugged, and training sessions are held to familiarize personnel with the system.

Upon completion of the implementation of each module, it will be determined which additional module(s) should be next. Programs will be written and tested and the procedures for the manual implementation will be modified as necessary. This process will continue until all modules have been fully implemented.

PHASE I. CENTRAL HARDWARE (8 months)

Task	1.	Choose alternative	1 month
	2.	Review needs	2 months
	3.	Write hardware/software RFP responses	2 months) concurrent
	4.	Prepare bench mark	2 months)
	5.	Issue RFP	1 month
	6.	Issue bench mark	1.5 months
	7.	Evaluate bench mark/RFP response	1 month
	8.	Order hardware/software	1 week

PHASE II. GENERAL SYSTEMS DESIGN (4 months)

Task		
1.	Required information flow	1 month
2.	Comparison of requirements	2 weeks
3.	Analysis of application	2 weeks
4.	Adaptation of existing design	2 weeks
5.	Review available software	2 weeks
6.	Implementation plan	2 weeks
7.	Management approval	2 weeks

PHASE III. DETAIL DESIGN (11.5 months)

Task		
1.	Develop processing system flowchart	1.5 months
2.	Define file requirements	3 months
3.	Determine equipment needs	2 weeks
4.	Refine implementation schedule	1 month
5.	Develop program specifications	4 months
6.	System test plan	1 month
7.	Conversion plan	2 weeks

PHASE IV. SYSTEM IMPLEMENTATION (15.5 months)

Task		
1.	Program development	3 months
2.	Develop control and clerical procedures	1 month
3.	System test	2 months
4.	User training	1.5 months
5.	Conversion	4 months
6.	Final acceptance	1 month
7.	Evaluate progress and direction	2 months

INDEPENDENT MODULES

Train staff	13 months
Install hardware	2 months

Total Elapsed Time — 42 months

WORK PLAN

The following paragraphs outline each phase and the work to be performed in each task.

Phase I – Central Hardware

Task One – Choose Alternative. The first major task is gaining agreement to commit to an alternative. Once one course of direction has been approved, the plan can move forward. The one month time frame set for this task is the length of time estimated to gain approval from the Boards of the agencies involved. However, before this task begins, the Electronic Data Processing Steering Committee must make a *specific* recommendation to be carried back to the Boards.

Task Two – Review Needs. The long-range EDP goals of the agencies were established in meetings held in August 1974. The agencies should now be given an opportunity to review those long-range plans in relation to the direction chosen in Task One and gain Board approval of those plans.

Task Three – Write Hardware/Software RFP Responses. Reviewing Task Two and the hardware recommendations in the Report to Electronic Data Processing Steering Committee should result in a general hardware design. Extensive review of the state of the art in data processing in both hardware and software (both systems and application) will lead to detailed hardware and software specifications which will appear in the RFP. Vendors should be contacted and given a chance to present seminars prior to the writing of the RFP. Conversion aids are a key consideration.

An alternate approach to writing an RFP is to issue a statement of the existing problems and the approximate financial constraints, allowing each vendor to design his own approach based on that vendor's strengths and perceptions.

Weighting criteria should be developed and distributed with the RFP. A statement of allowance for subjective factors (intangibles) should be included with the weighting criteria.

Task Four – Prepare Bench Mark. A bench mark should contain a representative sampling of existing programs, conversion tasks, application packages, future capabilities, and exercises of system software capabilities. Each agency should be given an opportunity to express the primary concerns which it wishes to have represented as a part of the bench mark.

Dates for each bench mark should be scheduled before the bench marks are issued. The bench mark material is then distributed on a staggered schedule corresponding to the date upon which each vendor is scheduled. This will provide all participating vendors with an equal amount of time. Weighting factors should be developed and distributed with the preliminary material requesting schedule dates. Delays of bench marks should count as negative weighting factors. Vendors are to submit sworn statements of total man-effort involved in bench mark preparation (listed by task).

Task Five – Issue RFP.

Task Six – Issue Bench Mark. All qualified vendors are issued RFP's, and bench mark material is distributed as suggested in Task Four. A bidder's conference is held one week from the date of RFP issuance. Specific time periods or personnel should be set up to answer questions pertaining to bench mark materials.

Task Seven – Evaluate Bench Mark/RFP Response. The bids and bench mark results are weighed based on the criteria distributed to all participating vendors. Agency representatives are given an opportunity to submit their subjective opinions and request a specific weight be attached to each. Once all the factors have been submitted, they will be evaluated based on weights by the entity (multiagency committee or independent consultant) empowered to prepare a final recommendation.

Task Eight – Order Hardware/Software. Based on recommendations from Task Seven, hardware and software is placed on order.

Phase II – General Systems Design

Task One – Required Information Flow. Interview supervisors and key personnel of all related functions, to determine operating procedures and information requirements. In addition, discuss information requirements with key management. As part of this task, the

constraints and policies under which the system must operate will be ascertained. These could include:

- Speed in reporting
- Data collection techniques
- User requirement
- Legal or district restrictions related to information that can be collected or information that can be provided.

In addition, review in depth numbering systems to determine the consistency of format. This analysis will help to minimize the problems of common systems.

Task Two – Comparison of Requirements. In this task the information collected in Task One will be compared to operations and information requirements with previously designed systems.

As differences are identified, meetings will be held with appropriate management to resolve the inconsistencies. Results of these meetings will provide the input for future tasks.

Task Three – Analysis of Application. To develop rules that will properly produce useful data that can be readily available in a variety of formats, it is necessary to understand the relationship that each data element has with respect to the entire system.

Task Four – Adaptation of Existing Design. Based on findings in the previous tasks, modification of the existing system and development of those modules and subsystems necessary to support the integrated systems will be developed.

Task Five – Review Available Software. The primary objective of this task is to review existing software to determine applicability to the new systems. Evaluate systems purchased or leased and other packages available from vendors. As a result, it may be possible to accelerate implementation by adapting existing software to the design. In reviewing these systems, consider the following criteria:

- Demonstrated operational status
- Economy of operation

- Compatability with your data processing capability
- Practicality considering desired capabilities
- Compliance with system requirements.

Task Six – Implementation Plan. In this task the priority of implementation, the timetable and responsibilities relative to implementing each module must be determined. This plan will indicate the time phasing of such major tasks as:

- Develop processing flowcharts
- Define file requirements
- Detail design
- Program development
- Develop procedures
- System test
- Training
- Conversion.

In addition, personnel resources (numbers and classifications) required for Phase II and III must be determined.

Task Seven – Management Approval. In this task, the general design will be presented in its entirety to management. In addition to an oral presentation, documentation will include:

- Generalized flowcharts of each module
- Complete narrative describing each module
- Recommended inventory management rules
- Sample inputs
- Sample output reports
- Implementation plan.

Phase III – Detail Design

Task One – Develop Processing System Flowchart. A detailed system flowchart will be developed depicting the flow of information through the data processing system. Included will be:

- Computer files (transaction, master, intermediate)
- Processing and utility programs.

Each flowchart will identify the specific inputs and output, developed in Phase I, required for processing. The system flowchart will be supported by a narrative description of the system, including functional descriptions of each program and any critical logic requirements.

Task Two – Define File Requirements. The next step in systems design is to define file requirements by logically grouping data elements into specific master files. Besides analyzing a multifile concept, explore the feasibility of utilizing an integrated data base. This concept has proven advantageous on similar projects because as new modules are integrated with existing systems it is often easier to program and modify an integrated data base. A detailed description of master files will include the following:

- File organization and sequence
- Data element names and sizes
- Documents which provide the information required in each file
- Output reports where element appears or is needed.

A controls document will also be produced describing five key elements of control that are considered in system design:

- Input controls
- Reject (error) controls

- Overall file balancing
- Audit trail capability
- Recovery and restart approaches.

Task Three – Determine Equipment Needs. The computer hardware configuration will be a major consideration in the detail design efforts. However, an analysis of processing volumes and flow may indicate the need for additional or reduced storage and/or processing capacity.

Task Four – Refine Implementation Schedule. Once the system design is completed, the next step in the project will be to refine the implementation schedule developed in Phase I. To ensure a smooth implementation effort, the schedule will include the following features:

- Detailed work steps
- Starting and completion dates
- Manpower and control features.

At this point it is imperative to determine the priority of implementation, the availability of resources and the scope of the effort. Periodic review points at the completion of major milestones will be incorporated within the plan.

Task Five – Develop Program Specifications. In this task, the system design is converted to computer specifications and manual procedures and readied for programming and implementation. The procedure for modules that will be manual may require modification when the module is automated. The preparation of these manual procedures will be determined by the conversion timetable.

After the data base files are finalized, individual program write-ups are prepared. These specifications are prepared for each program of the system and will include:

- The program name
- A program abstract

- A narrative description of the program logic
- A block diagram of complicated logic routines
- A description of input and output.

Task Six – System Test Plan. Further refinement of the implementation plan is accomplished by developing a detailed system test plan. The test plan will include the following elements:

- Scope and objectives of the test
- How and when it is to be conducted
- Types of conditions to be tested
- Test data to be used
- Output verification methods
- Computer time estimates
- Personnel requirements
- Control schedule.

The system test will simulate as closely as possible actual operating conditions and will test all conditions and exceptions.

Task Seven – Conversion Plan. A conversion plan will be created which will detail a realistic schedule of events necessary to convert from the current operating environment to the new system. The plan will include the following:

- Detailed steps of conversion activity
- Starting and completion dates
- Personnel requirements
- Critical paths
- Plans for training both user and data processing personnel.

At this time, it is possible to again refine the detailed design work plan, developed in Phase I, for subsequent modules of the total system.

Phase IV – System Implementation

Task One – Program Development. The major activity of this task is the coding and testing of each individual program of the system. Emphasize the use of structured programming techniques to reduce the time required to produce code, debug, and to maintain programs.

Immediately after programming efforts are completed, it will be the responsibility of each programmer to develop test data for his programs. Each program will be tested and debugged to a level considered acceptable before a complete system test effort begins.

Task Two – Develop Control and Clerical Procedures. Simultaneously with the programming efforts, the clerical and control procedures necessary to ensure accurate systems operations are documented. A user's manual will be developed and written in a manner specifically geared to the operating level of individuals performing the functions.

The types of information included in the manual will be as follows:

- Source document preparation procedures
- Data entry instructions
- Output report distribution procedures
- Error correction and reentry procedures
- Control and balancing procedures (input, run-to-run, files, output).

The clerical and control procedure documentation will be reviewed by management and appropriate user staff prior to preparation of final manuals.

Task Three – System Test. The test strategy developed during Phase II will be implemented for a final system test prior to conversion. All input, files, output and associated processing will be tested under conditions and with data similar to actual operations.

In evaluating the test results, established control procedures will be used so that adequacy of the systems and procedures can be determined. Any changes to the design programs or procedures will be reviewed, approved and documented.

Task Four – User Training. Simultaneously with computer system testing, clerical, shop, management, and data processing personnel will be trained. Training material will be prepared and appropriate seminars will be scheduled. It is necessary that all training be completed prior to conversion efforts.

Task Five – Conversion. This task represents the culmination of efforts of the entire project. The conversion plan developed as part of Phase II will guide the new system to actual operation.

It is anticipated that one module will be implemented at a time. Parallel operations will be maintained until the system is fully operational under fully loaded conditions. Frequent progress meetings will be maintained to monitor the system during this crucial conversion activity.

Task Six – Final Acceptance. Final acceptance of the system requires an objective review and analysis of operations which begins the day the first output is produced in a live environment.

An evaluation will take place as the system is observed in operation and would include the following evaluation factors:

- Reliability and timely operation of computer programs
- Reasonable level of rejects
- Balance and control of master files
- Proper use of output.

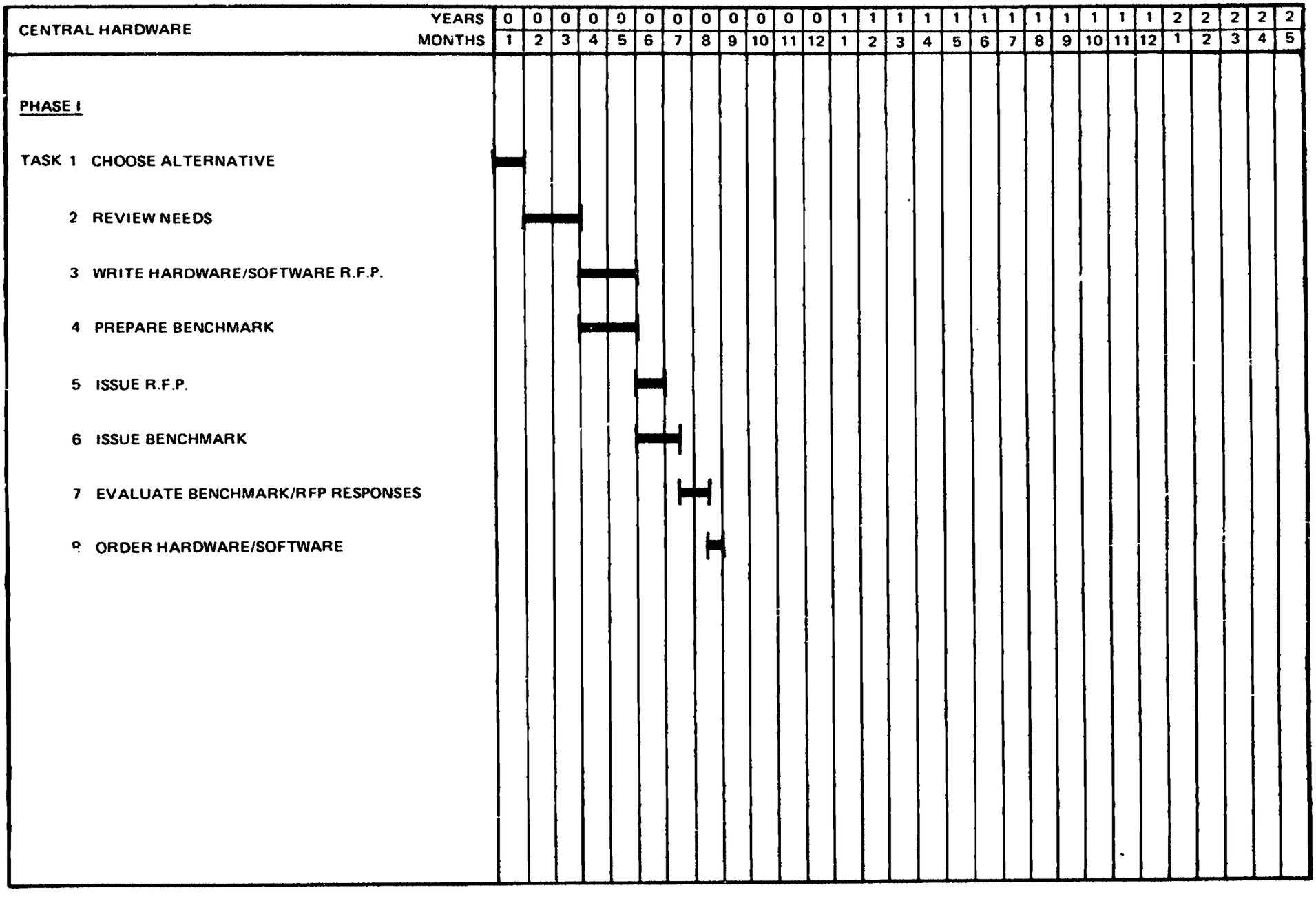
Acceptance criteria are to be developed which will significantly aid the acceptance process to ensure that the system objectives are being realized.

Task Seven – Evaluate Progress and Direction. Three months after common applications have been running on a central installation, a two-month evaluation should be performed to evaluate whether the implementation of common systems achieved the objectives set over two years ago. The long-range plans should also be reviewed to determine if they are still valid at this time or whether they require modification.

Train Staff. This includes operator training, system software, application packages, vendor supplied ANS compilers, and training in project management and structured programming. Most of the existing staffs are proficient in COBOL. The amount of time necessary to provide a high level of competence in ANS COBOL and efficient use of vendor extensions will depend on available training capability of the vendor or outside education facility and the degree of similarity between existing knowledge and necessary knowledge for the selected system.

Install Hardware/Software. Installation includes acceptance tests specified by the agencies (usually a repeat of the bench mark), tests of system software, and all application packages being installed as well as the obvious hardware tests. The first two months will provide for parallel operation (agencies will continue to run on their own machines, and checking the results of the central computer runs).

IMPLEMENTATION – ALTERNATIVE 2



IMPLEMENTATION – ALTERNATIVE 2